

# APPLICATION UNDER UNITED STATES PATENT LAWS

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Invention: VIDEO RECORDING AND REPRODUCING APPARATUS AND VIDEO RECORDING METHOD

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This is a:

- ☐ Provisional Application
- ☒ Regular Utility Application
- ☐ Continuing Application
  - ☐ The contents of the parent are incorporated by reference
- ☐ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application
- ☐ Substitute Specification
  - Sub. Spec Filed \_\_\_\_\_
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  - Sub. Spec. filed \_\_\_\_\_
  - In App. No. \_\_\_\_\_ / \_\_\_\_\_

## SPECIFICATION

## **Addendum**

### **Invention Title**

**VIDEO RECORDING AND REPRODUCING APPARATUS AND VIDEO RECORDING  
METHOD**

TITLE OF THE INVENTION

VIDEO RECORDING AND REPRODUCING APPARATUS AND VIDEO  
RECORDING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

5           This application is based upon and claims the  
benefit of priority from prior Japanese Patent  
Application No. 2003-155937, filed May 30, 2003, the  
entire contents of which are incorporated herein  
by reference.

10                           BACKGROUND OF THE INVENTION

1. Field of the Invention

          The present invention relates to a video recording  
and reproducing apparatus that can record and reproduce  
videos broadcast by a broadcasting satellite or a  
15       communication satellite or using an electric wave in a  
VHF band or a UHF band, and in particular, to a video  
recording and reproducing apparatus in conformity with  
a DVD-VR standard.

2. Description of the Related Art

20       VTR (Video Tape Recorder) apparatuses using  
magnetic tapes as recording media are commonly used as  
video recording and reproducing apparatuses. In recent  
years, video recording and reproducing apparatuses have  
also been popular which use DVD-RAMs (Digital Versatile  
25       Disk-Random Access Memories, that is, optical disks in  
conformance with a DVD standard in and from which  
information can be recorded and reproduced and deleted

at any time and which are called "RAM disks") or  
DVD-RWs (Digital Versatile Disk-Rewritables, that is,  
optical disks in conformance with the DVD standard  
in and from which information can be recorded and  
5 reproduced and deleted at any time and which are called  
"recording and reproducing disks").

Many video recording and reproducing apparatuses  
are provided with a timer recording function or a  
reserved recording function composed of a timer circuit  
10 or the like. Accordingly, even if a user is out, it is  
possible to record a program broadcast through a  
predetermined channel, at a time reserved and specified  
using a timer. Therefore, the user can view programs  
recorded on arbitrary days at arbitrary times.

15 Jpn. Pat. Appln. KOKAI Publication No. 6-36389  
proposes an apparatus having a timer reservation  
information recording section. The timer reservation  
information recording section identifies a broadcasting  
signal state, for example, a multiplexed sound at a  
20 time when the timer is started. If the broadcasting  
signal state remains unchanged, the timer reservation  
information recording section determines that the  
preceding program has been extended and changes the  
reserved time of the target program so that recording  
25 starts after the broadcasting signal state changes.

With the above described video recording and  
reproducing apparatus, when recording is started by a

reserved recording function, a power supply is turned on a predetermined time before a reserved start time for recording initialization required to switch a channel to be recorded and set a recording mode typified by image and sound quality on the basis of pre-inputted (preset) reservation information. That is, an amount of time is required before the reserved recording start time in order to achieve the recording initialization.

Thus, if two temporally contiguous recording reservations are inputted (set), a short time zone during which no programs can be recorded occurs between the recording reservation set for an earlier time and the recording reservation set for a later time.

Accordingly, if the two programs reserved for recording each use all of its broadcasting time, then disadvantageously no programs can be recorded during the time required for the recording initialization, at the end of the earlier program reserved for recording or at the beginning of the later program reserved for recording.

This problem is not solved by the technique disclosed in Jpn. Pat. KOKAI Publication No. 6-36389 and is of course involved in this technique.

#### BRIEF SUMMARY OF THE INVENTION

An aspect of the invention, there is provided to a video recording method comprising: receiving a video

signal or an audio signal; encoding received the video  
signal or the audio signal into a predetermined form;  
and operating if two consecutive recording operations  
are set, to record the two recording operations so as  
5 to record a period from the start of the earlier first  
recording to the end of the succeeding second recording  
as one recording operation, and to record an identifier  
that can identify the first recording and the second  
recording to manage the end of the first recording and  
10 the start of the second recording, in a predetermined  
area of the recording medium.

An aspect of the invention, there is provided to a  
video recording and reproducing apparatus comprising: a  
signal receiving section which converts a video signal  
or an audio signal; an encode section which encodes the  
15 signal received by the signal receiving section into a  
predetermined form; a recording device which records  
the encoded signal encoded by the encode section and a  
management information signal for the encoded signal,  
20 in a recording medium; a reproducing device which  
reproduces a video signal or an audio signal on the  
basis of the encoded signal and the management  
information signal for the encoded signal which are  
recorded in the recording medium; a recording  
25 reservation information retaining device which retains  
recording reservation information including a start and  
end of recording of the video or the audio signal as

well as recording conditions in the recording medium  
which recording is executed by the recording device;  
and a recording control device which operates if a  
first and second pieces of recording reservation  
5 information in which a recording end time and a  
recording start time, respectively, that are consecu-  
tive are set, to start second recording based on the  
second piece of recording reservation information and  
including recording of an identifier that can identify  
10 the first recording and the second recording after  
first recording based on the first piece of recording  
reservation information has been ended.

An aspect of the invention, there is provided to a  
video recording and reproducing apparatus comprising: a  
15 signal receiving section which converts a video signal  
or an audio signal; an encode section which encodes the  
signal received by the signal receiving section into a  
predetermined form; a recording device which records  
the encoded signal encoded by the encode section and a  
20 management information signal for the encoded signal,  
in a recording medium; a recording medium managing  
device which controls recording of the management  
information signal and the encoded signal in the  
recording medium which recording is executed by the  
25 recording device; a reproducing device which reproduces  
a video or an audio signal on the basis of the encoded  
signal and the management information signal for the

encoded signal which are recorded in the recording medium; a recording reservation information retaining device which retains recording reservation information including a start and end of recording of the video or  
5 the audio signal as well as recording conditions in the recording medium which recording is executed by the recording device; and a recording control device which operates if a first and second pieces of recording reservation information in which a recording end time  
10 and a recording start time, respectively, that are consecutive are set, to start second recording based on the second piece of recording reservation information after first recording based on the first piece of recording reservation information has been ended, and  
15 to record an information signal indicative of the end of the first recording and the start of the succeeding second-recording, in an information recording section of the management information signal recorded by the recording medium managing device in the recording  
20 medium.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently preferred embodiments of the  
25 invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the



principles of the invention.

FIG. 1 is a block diagram illustrating an example of the configuration of a video recording and reproducing apparatus to which an embodiment of the present invention is applied;

FIG. 2 is a schematic diagram illustrating a DVD-VR standard required to record recording data utilized in the video recording and reproducing apparatus shown in FIG. 1;

FIG. 3 is a schematic diagram showing the relationship between M\_VOBI and each of PGI, CI, and EPI in a file (VMG) described with reference to FIG. 2 and in which management information is recorded;

FIG. 4 is a schematic diagram illustrating the concept of a play list in the video recording and reproducing apparatus according to the present invention;

FIG. 5 is a conceptual drawing illustrating in detail the play list shown in FIG. 4;

FIG. 6 is a schematic diagram showing an example of display of a GUI screen that can be utilized for the video recording and reproducing apparatus described with reference to FIGS. 1 to 5;

FIG. 7 is a timing chart illustrating an example of operations of the video recording and reproducing apparatus performed if contiguous programs are reserved;

FIG. 8 is a flow chart illustrating an example of operations required for actual recording described with reference to FIG. 7; and

FIG. 9 is a flow chart illustrating an example of operations for a recording end process described with reference to FIG. 8 and performed when the reserved recording is extended.

#### DETAILED DESCRIPTION OF THE INVENTION

With reference to the drawings, a detailed description will be given below of a video recording and reproducing apparatus that is an embodiment of the present invention.

FIG. 1 is a block diagram illustrating an example of the configuration of a video recording and reproducing apparatus to which an embodiment of the present invention is applied.

In FIG. 1, a video recording and reproducing apparatus 1 has a TV tuner (signal receiving section) 100 that selectively receives space transmission (radio wave) or a broadcasting signal of a predetermined channel and an external input terminal (Ext.In, i.e., signal receiving section) 101 to which video signals and sound signals can be inputted. Externally inputted video and sound signals are inputted to a video decoder 102 and an audio A/D converter 103, respectively.

When a video and a sound are recorded, the video decoder 102 and the audio A/D converter 103 convert the

video and sound signals, respectively, into digital signals. An MPEG encoder 104 then encodes (compresses) these digital signals into data in an MPEG form.

5       The compressed (encoded) video and sound signals are saved, via a disc controller 105, to a hard disk device (HDD) 106 or a DVD-RAM disk M pre-installed in a DVD drive device 107.

10       When a video and a sound are reproduced, MPEG signals (compressed signals) are read from the HDD 106 or the DVD-RAM disk M and then inputted to an MPEG decoder 108. The MPEG decoder 108 then decodes the MPEG signals to convert them into an analog video signal and an analog sound signal, respectively, via a video encoder 109 and an audio D/A converter 110.

15       The analog video and sound signals from the video encoder 109 and the audio D/A converter 110, respectively, are outputted to a video out terminal 111 and an audio out terminal 112, respectively.

20       Specifically, a video and a sound outputted by the video recording and reproducing apparatus 1 are reproduced by connecting, for example, a television receiver or a video display device (monitor device) and an audio amplifier which can reproduce videos and sounds, respectively, to the video out terminal 111 and  
25       the audio out terminal 112, respectively.

      A micro computer 113 as a main control section controls individual circuits or units in the video

decoder 102, MPEG encoder 104, disc controller 105, MPEG decoder 108, the video encoder 109, and others.

A video timer computer 114 is connected to the micro computer 113. The timer computer 114 turns on a main power supply at a preset time or a predetermined time before the preset time even if a main power supply circuit (not shown) of the video recording and reproducing apparatus 1 is off. The timer computer 114 thus causes each section of the main body of the apparatus 1 to stand by and get ready for recording before reserved recording is started. Thus, when the reserved time is reached, a program broadcast through a reserved channel, that is, associated videos and sounds, are recorded under preset recording conditions.

The timer computer 114 connects to a main body side operation panel 115 that enables inputting of operations of the video recording and reproducing apparatus 1, for example, recording start (REC), image reproduction (PLAY), (recording and reproduction) stop (STOP), and skip (SKIP), inputting of a time setting/reserved time (HOUR, MIN, DAY, MONTH), inputting of reservation conditions (RATE, MODE, HDD, DISK), inputting of a control signal corresponding to reset (COUNTER RESET) or the like, turning on/off of the main power supply, and the like.

Furthermore, the operation panel 115 connects to a remote controller receiving section 116 that accepts

various control signals inputted by a remote controller R. Accordingly, control signals from the remote controller R which are similar to corresponding control signals inputted from the operation panel 115 can be  
5 inputted from a position located away from the apparatus 1 main body.

FIG. 2 is a schematic diagram illustrating a DVD-VR (DVD Video Recording) standard required to record recording data utilized in the video recording  
10 and reproducing apparatus shown in FIG. 1.

According to the DVD-VR standard, data is managed using a VRO file (VR\_MOVIE. VRO) in which actual data for motion pictures is recorded and an IFO file (VR\_MANGR. IFO) in which management information such as  
15 a recorded position of the data and title information is recorded (there is also a file for still images but its description is omitted in the present proposal):

Information on motion pictures and sounds is recorded in the VRO file using an MPEG2 program stream  
20 system. If a plurality of recording operations (recording of information) are performed, then after the first data has been recorded, the second data is recorded in the same file.

In this manner, a plurality of recording data are  
25 recorded in the same file. Accordingly, the IFO (information) file is provided to manage individual recording data. According to the DVD-VR standard,

motion picture data created for a single recording operation is called M\_VOB (Movie Video Object). The IFO file indicates where in the file each M\_VOB is recorded. This area of the IFO file is called M\_VOBI (Movie Video Object Information).

FIG. 3 is a schematic diagram showing the relationship between the M\_VOBI and each of PGI, CI, and EPI in the VMG (a file in which the management information is recorded) described with reference to FIG. 2.

As shown in FIG. 3, the IFO file contains PGI (ProGram Information) required to indicate the M\_VOB, which contains physical recording data, to a user in a "title" form.

The PGI includes plural pieces of CI (Cell Information). Each piece of CI includes an arbitrary reproduction start and end positions in the corresponding M\_VOBI. That is, if for example, any frames are deleted from arbitrary M\_VOBI resulting in a discontinuous file, the individual pieces of CI are beneficial in continuously reproducing information from the M\_VOBI.

The CI includes an arbitrary number of pieces of EPI (Entry Point Information). The EPI indicates a position where reproduction is started. The operations are defined (mandatory) so that if a skip control signal is inputted during image reproduction using a

"Skip Forward" key, the reproduction is continued from the first piece of EPI located behind the present reproduction position.

FIG. 4 is a schematic diagram illustrating the concept of a play list.

The CI, included in the PCI, described with reference to FIG. 3, corresponds to the M\_VOBI, physical recording data, on a one-to-one basis.

Thus, in the VMG described with reference to FIG. 3, for example, the M\_VOBI#1, containing a single one-hour program, and the M\_VOBI#2, containing two consecutive one-hour programs are not associated with two pieces of M\_VOBI (there pieces of CI are not associated with two pieces of M\_VOBI).

In contrast, the play list (UD\_PGCI) shown in FIG. 4 contains virtual titles that refer only to required-sections in the M\_VOBI.

Specifically, in FIG. 4, the CI included in any piece of the PGI shown below the three M\_VOBs (M\_VOB#1 to V\_VOB#3) in the drawing corresponds to the M\_VOBI on a one-to-one basis. However, the CI included in the UD\_PGCI refers to a section of the M\_VOBI.

For example, in FIG. 4, the area referred to by the CI#2 is smaller than the entire area of the M\_VOB#3. However, the DVD-VR standard specifies that the area of an arbitrary M\_VOBI which is not referred to by the corresponding CI has an upper limit value of

4GOP (for example, the GOP is 15 frames).

Therefore, by creating the UD\_PGCI (play list) shown in FIG. 4, it is possible to refer to the first M\_VOBI#1 using one cell (CI#1) and then refer to the second M\_VOBI#2 using two cells (CI#2 and CI#3).

In this manner, CI referring only to a part of the M\_VOBI can be compiled using a play list (UD\_PGCI).

More specifically, as shown in FIG. 5, two recording reservations (a recording reservation section 1 and a recording reservation section 2) are recorded in one piece of M\_VOBI. Then, EPI#1 is provided (inserted) at the boundary position between the sections 1 and 2 and on the cell CI#1 side.

Two cells CI#1 and CI#2 referred to using one play list (UD\_PGCI#1) are defined in association with the EPI#1.

When the play list (UD\_PGCI#1) shown in FIG. 5 is created, even if one M\_VOBI#1 contains two recording reservations and the user instructs on a skip to the second cell CI#2 (recording reservation section 2), reproduction can be started with the video recorded with the recording reservation 2 on the basis of the EPI#1.

Specifically, the user can obtain the UD\_PGCI corresponding to the first recording reservation in the M\_VOBI containing two consecutive one-hour programs and the UD\_PGCI containing the second recording



reservation, as well as the original M\_VOBI (original title). In other words, a play list referring only to the respective reservation sections is created. This makes it possible to independently check the results of the first and second recording reservations (the results can be separately viewed).

Now, description will be given of the recording reserving function of the vide recording and reproducing apparatus described with reference to FIGS. 1 to 5.

FIG. 6 is a schematic diagram showing an example of display of a GUI (Graphical User Interface) screen which is displayed on a television receiver or monitor device (display device) connected to the video recording and reproducing apparatus and which can be utilized to, for example, set recording reservations.

Information inputted to set a recording reservation includes, for example, a channel number, the date and time on and at which recording is to be started, the date and time on and at which recording is to be ended, image quality, and sound quality.

On the basis of the recording reservation set using the GUI, the main power supply to the video recording and reproducing apparatus 1 is turned on at the recording reservation start time managed by the timer computer 114 or a predetermined time before the recording reservation start time. Before the start of recording, for example, the channel is switched and the

image and sound quality for recording is set. In this state, a standby state is maintained for a predetermined time before the start of the recording. The recording is ended at the recording end time. If there  
5 are no succeeding recording reservations, the timer computer 14 controllably turns off the main power supply after a predetermined time has passed.

FIG. 7 is a timing chart illustrating an example of operations of the video recording and reproducing  
10 apparatus performed if contiguous programs are reserved.

For example, if a recording reservation 1 for a drama 1 is set for the time from 19:30 to 21:00 and a recording reservation 2 for a drama 2 is set for the  
15 time from 21:00 to 23:00, an operation for the actual recording 1 (an operation of a common recording and reproducing apparatus) starts the recording for the recording reservation 1 at 19:30:00 but ends it at 20:59:45.

20 Specifically, during 15 minutes before 21:00:00, when the reserved recording 2 is started, the channel is switched and the image and sound quality is set. Then, the recording for the recording reservation 2 is started just at 21:00.

25 However, with the operation for the recording 1, if the end of the reserved recording 1 contains a normal video, the corresponding video and sound are

lost for at most 15 minutes.

In contrast, using the operation for the actual recording 2 substantially prevents the video and sound from being interrupted. Thus, an otherwise one-hour reserved recording can be carried out so that a single two-hour program is recorded. In this case, as described later with reference to FIG. 8, the recording reservations 1 and 2 preferably have the same recording conditions, that is, the same image and sound quality, and also involve the same channel (the channel need not be switched).

In other words, the video and sound are substantially prevented from being interrupted by continuing the recording even after the end time of the reserved recording 1 without a stop and then stopping it at the end time of the reserved recording 2. In this case, the recording reserved as the recording reservation 2 is deleted by the timer computer 114.

Furthermore, by inserting the EPI#1 between the recording 1 and the recording 2 as previously described with reference to FIG. 5 and/or creating a play list (UD\_PGCI#1), it is possible to start reproduction with images for the recording reservation 2 even if the user instructs on a skip to the recording 2.

On the other hand, if the recording reservations 1 and 2 have the same recording conditions, that is, the same image and sound quality, then even if they reserve

different channels, the channel can be switched when the reserved recording 2 is executed after the reserved recording 1 as described in an operation for actual recording 3. That is, when the recording for the recording reservation 1 and the recording for the recording reservation 2 are executed on the basis of the two consecutive recording reservations, the earlier reserved recording must be stopped if the image and sound quality must be changed. Accordingly, if the recording for the recording reservation 1 and the recording for the recording reservation 2 have the same conditions except for the channel, continuous recording can be achieved by tolerating the disturbance of the image and sound which may occur when the channel is switched.

As shown in the actual recording 3 in FIG. 7, the time for which the video and sound are disturbed can be minimized by pausing the recording operation of the video recording and reproducing apparatus when the channel is switched between the recording for the recording reservation 1 and the recording for the recording reservation 2.

FIG. 8 is a flow chart illustrating an example of operations required to execute the actual recording 2 and actual recording 3, described with reference to FIG. 7.

As shown in FIG. 8, with the video recording

and reproducing apparatus, recording is started in accordance with reservation information on the recording reservation 1 (S1).

Subsequently, it is checked whether or not the  
5 present time is a predetermined time, for example, 15 seconds before the end time of the reserved recording 1 (S2). Then, it is sensed that the present time is 15 seconds before the end time of the reserved recording 1, at which point (S2-Y) it is checked  
10 whether or not the next reservation information is temporally contiguous to the recording 1 (S3).

At step S3, if no contiguous reservations are set (S3-N), it is checked whether or not the reserved recording 1 is to be ended at the present time (S4).  
15 When the end time is reached (S4-Y), the recording is stopped (S5).

In contrast, if it is determined at step S3 that any contiguous reservation is set (S3-Y), it is checked whether or not the reservation has the same recording  
20 conditions.

At step S6, if the recording conditions for the recording reservation 1 are different from the recording conditions for the recording reservation 2 (S6-N), the recording is stopped when the end time of  
25 the reserved recording 1 is reached (S4, S4-Y, S5).

At step S6, if it is confirmed that the contiguous recording reservations have the same recording

conditions (S6-Y), then it is checked whether or not the recording for the recording reservation 2 involves the same channel as that for the recording for the recording reservation 1 (S7).

5           At step S7, if it is sensed that the recording for the recording reservation 1 and the recording for the recording reservation 2 involve the same channel (S7-Y), the end time of the reserved recording 1 is extended to the end time of the reserved recording 2  
10       (S8). Then, the information on the recording reservation 2 is deleted (S9).

          At step S7, if it is sensed that the recording for the recording reservation 1 and the recording for the recording reservation 2 involve different channels  
15       (S7-N), the end time of the reserved recording 1 is extended to the end time of the reserved recording 2.

Furthermore, the channel is switched (S10).

          In this case, for example, the recording may be paused at the end time of the recording for the  
20       recording reservation 1. Then, the pause may be cleared when it is sensed that the channel is switched. The information on the recording reservation 2 is deleted in step S9.

          Thus, it is assumed that the two temporally  
25       contiguous recording reservations, that is, the first recording reservation (recording reservation 1) and the second recording reservation (recording reservation 2),

are set. Then, the two programs can be continuously recorded without interrupting the video or sound at the end of the recording for the recording reservation 1, by extending the end time of the reserved recording 1 to the end time of the reserved recording 2, that is, rewriting the end time of the reserved recording 1 so that it changes to the end time of the reserved recording 2.

In the description of the above example, at step S10, the recording for the recording reservation 2 is executed after the recording for the recording reservation 1, and the channel is switched at the end time of the reserved recording 1. However, of course, the recording may be stopped at the end time of the reserved recording 1.

FIG. 9 is a flow chart illustrating an example of operations for the recording end process described with reference to FIG. 8 and performed when the reserved recording is extended.

With the recording reservation extending process shown in FIG. 8, the recording for the two contiguous recording reservations, that is, the recording for the first recording reservation 1 and the recording for the second recording reservation 2, is stored in the HDD or DVD-RAM disk M as a substantially single recording operation. In this case, for an easy determination as to where the recording based on the recording

reservation 2 starts, the EPI (entry point) is inserted at the position of the start time of the recording for the recording reservation 2 (S102) if a recording reservation extending process has been executed, as  
5 previously described with reference to FIG. 5.

Subsequently, a play list (UD\_PGCI#1) for the recording section for the recording reservation 1 is created (S103). Moreover, a play list (UD\_PGCI#1) for the recording section for the recording reservation 2  
10 is created (S104).

Specifically, if a recording reservation extending process has been executed, the EPI, previously described with reference to FIG. 5, is inserted between the end time of the recording for the recording  
15 reservation 1 and the start time of the recording for the recording reservation 2. Then, a play list is created for each of the recording reservations preceding and succeeding the EPI. Then, even if the user instructs on a skip to the recording reservation  
20 2, reproduction can be started with the video recorded on the basis of the recording reservation 2.

The present invention is not limited to the above described embodiment. Arbitrary variations or changes may be made to the above embodiment without departing  
25 the spirits of the present invention. For example, in the above description of the embodiment, videos and sounds are recorded. However, it should be appreciated



that equivalent operations and effects can be achieved even if only sounds are recorded. Furthermore, in the above description of the embodiment, the video recording and reproducing apparatus uses an optical disk (RAM disk) or hard disk as a recording medium. 5. However, it should be appreciated that equivalent operations and effects can be achieved using, for example, a conventional VTR provided that the VTR has equivalent characteristics.

10 As described above, the present invention avoids the situation in which when temporally consecutive programs are recorded using a reserved recording function, no programs are recorded during the time required for recording initialization.

15 Furthermore, according to the present invention, if the video recording and reproducing apparatus determines that reservation information on a plurality of recording reservations set by the user indicates contiguous times and the same channel, the earlier 20 recording is continued to the end time of the next reservation without a stop. This prevents a failure to execute recording in a certain section in the middle of the contiguous reserved recording operations.

25 The present invention is not limited to the embodiments described above and can be modified in various manners without departing from the spirit and scope of the invention.